Analysis of Electrical Conductivity of Ground Water at Different Location for Crop Suitability of Pimpri Village

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Abstract— In this paper, we discuss about the recently collected sample of ground water at surrounding locations of Pimpri village and its experimental analysis in laboratory for Electrical conductivity. Further, we analyze our findings with the established results and concluded that electric conductivity depends on areas as well as months also.

Key words: Electrical Conductivity, Irrigation, Ground Water, Surface Water, Water Quality

I. Introduction

Conductivity is a measure of the ability of water to pass an electrical current. Electrical conductivity (EC) is a measurement of the dissolved material in an aqueous solution, which relates to the ability of the material to conduct electrical current through it. EC is measured in units called Seimens per unit area (e.g. mS/cm, or miliSeimens per centimeter), and the higher the dissolved material in a water or soil sample, the higher the EC will be in that material. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol,and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius (25 C). Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water. Ground water inflows can have the same effects depending on the bedrock they flow through. Discharges to streams can change the conductivity depending on their make-up. A failing sewage system would raise the conductivity because of the presence of chloride, phosphate, and nitrate; an oil spill would lower the conductivity.The basic unit of measurement of conductivity is the mho or siemens. Conductivity measured µmhos/cm or microsiemens per centimeter (µs/cm). Distilled water has a conductivity in the range of 0.5 to 3 µmhos/cm. The conductivity of rivers in the United States generally ranges from 50 to 1500 µmhos/cm. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of 1fish or macroinvertebrates. Industrial waters can range as high as 10,000 µmhos/cm.

Conductivity σ is defined as the inverse of resistivity: $\sigma = \frac{1}{\rho}$

Here σ = Conductivity
ρ = Resistivity

II. Materials & methods

A. Study area

To evaluate the electrical conductivity of ground water for crop suitability in Pimpri village in yeola of Maharashtra of latitude: 20.1167576 and longitude: 74.365623.

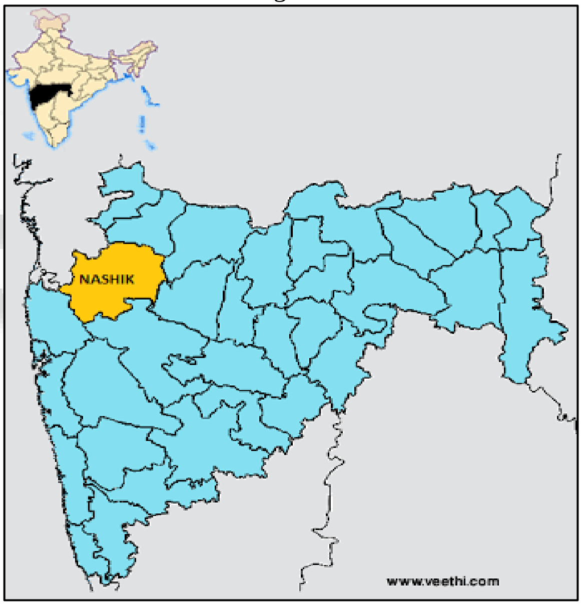

Fig. 2.1.1: Map showing Nashik in Maharashtra

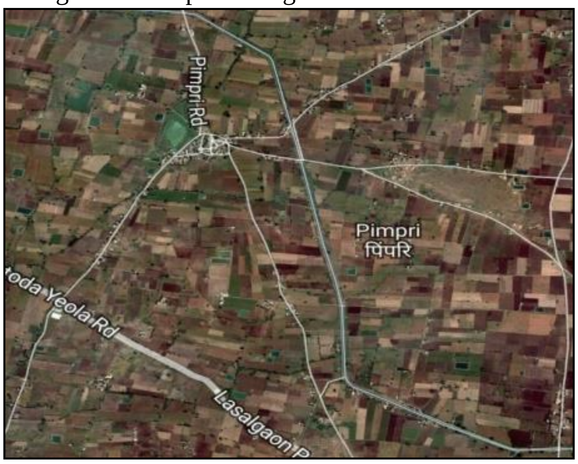

Fig. 2.1.2: Location map of study area (Pimpri village) in Nashik.

III. OBJECTIVES

- To select suitable site for study.
- To collect samples from different locations with monthly variation.
- To determine conductivity of sample collected by conductivity meter.
- To suggest the farmer which crop is suitable for their land.
- To compare the results with WHO, BIS standards.

IV. LITERATURE REVIEW

A. Swarna latha, et.al. (2017)

The groundwater quality is very important for the drinking purpose where the surface water is not available and near industrial developments in the world, in India it is mandatory for monitoring the quality of water due to heavy discharge of effluents directly, in the present study five sampling stations were selected for the assessing the groundwater quality in kondapalli industrial region, and assessing the physicochemical parameters like The samples were analyzed various water quality parameters such as pH, electrical conductivity (EC), Total Dissolved Solids (TDS), Total Hardness (TH), Chloride, sulphate, nitrates, iron, calcium, magnesium, and fluoride using standards procedures, the minimum, maximum, mean, median, and standard deviation were tabulated and compared with water quality standards BIS, WHO.USPH, the results indicate that due to discharge of industrial effluents groundwater quality is changed and make unsuitable for drinking purpose.

B. Salahuddin, (2015)

In this paper, we discuss about the recently collected sample of ground water at surrounding locations of Dildar Nagar village and its experimental analysis in laboratory for Electrical conductivity. Also, we represents the data graphically and interpreted the data using the method called analysis of variance. Further, we analyze our findings with the established results and concluded that electric conductivity depends on areas as well as months also.

C. Khola R.K., et.al. (2013)

This research paper is the extension of earliar work carried out by choudhary et.al in this paper we analysis the data by statistical tool two way anova. After analysis we conclude that chloride content in the surface of water at different location only. It means at different location the chloride content is different. But it never changes according to months.

D. Divya Bhardwai, et.al.(2017)

Water is a limited natural resource. Therefore, preserving water is very important for protection of our environment. Various water quality monitoring systems have been developed to measure concentration of the constituents in quantity for characterisation of water for different uses. Water quality can be estimated through quality index which in turn is analysed through various parameters such as pH level, Turbidity, Dissolved Oxygen, Conductivity etc. This paper addresses the impact of parameters on water quality index. Moreover, the paper also depicts how water can be utilised based on various values of parameter.

E. Mushtaq Hussain,et.al.(2013)

Ground water quality is important as it is the main factor determining its suitability for drinking, domestic, agricultural and industrial purposes. The suitability of groundwater for drinking and irrigation has been assessed in patancheru industrial area of medak district of Andra Pradesh, India. In order to assess the ground water quality forty ground water samples were collected in pre-monsoon 2008 and post-monsoon 2008 and analyzed for physical and chemical parameters.

V. ANALYSIS OF ELECTRICAL CONDUCTIVITY:

Ground water from 14 wells and 4 artificial pond Stations named as sample-GW1, GW2, GW3 upto GW14 are open wells and from GW15 to GW18 are artificial ponds. The 1ground water samples collected in one liter pre-cleaned polyethylene bottles and tested in the laboratory using standard methods for assessing the physico-chemical parameters and BIS, WHO procedures were used to analyze the groundwater quality parameters.

EC at 25^{0}C Micromhos/cm	Salinity	Application
<250	Low	Suitable for all crops-field crops, forage crops (grasses), vegetable crops and fruit crops on all soils.
250 to750	Medium	Suitable for field crops, forage crops (grasses), vegetable crops and fruit crops on soil with moderate drainage
750 to 2250	High	Suitable for some salt tolerant field crops (cotton, wheat), some varieties of grasses and fruit crops (pomegranate, date palm) on soil with good drainage.
2250 to 3000	Very High	Suitable for a very few salt tolerant field crops (cotton, wheat), and a few varieties of grasses only on soil with excellent drainage.

Table 1: Classification of EC of irrigation water in relation to its application:

CODE	Sampling Station	Source
GW1	Hanuman Galli	Open well
GW2	Barad Vasti	Open well
GW3	Motha Mala	Open well
GW4	Gund Vasti	Open well
GW5	Kahar Vasti	Open well
GW6	Pansare Vasti	Tube well
GW7	Kudal vasti	Open well

GW8	Malran	Open well
GW9	32 Chari	Open well
GW10	Panmala	Open well
GW11	Kuran Vasti	Tube well
GW12	Gawthan	Open well
GW13	Shinde Vasti	Open well
GW14	Jadhav Vasti	Open well
GW15	Barad Vasti	Artificial Pond
GW16	Gavthan	Artificial Pond
GW17	Gund Vasti	Artificial Pond
GW18	Pansare Vasti	Artificial Pond

GW=groundwater Sample

CODE	Aug	Sept	Ocr	Nov	Dec	Jan	Feb
GW1	820.6	837.1	863.1	853.7	842.5	863.5	895.52
GW2	924.7	958.1	978.2	963.2	954.8	960.2	1009.67
GW3	719.8	735.4	750.1	730.3	720.1	765.6	775.89
GW4	341.1	362.5	370.3	350.3	335.8	361.2	377.41
GW5	645.8	640.1	680.1	640.2	620.8	650.2	664
GW6	1230.1	1240.2	1236.2	1223.1	1182.3	1205.7	1252.62
GW7	940.3	980.3	1009.6	998.2	982.3	1003.3	1102.62
GW8	830.6	886.4	898.1	867.3	830.2	850.3	874019
GW9	829.3	840.5	871.3	840.1	801.2	831.6	862.90
GW10	720.4	730.9	773.8	730.3	706.6	740.1	769.35
GW11	1398.1	168.6	1431	1403.1	1380.2	1401.2	1435
GW12	530.3	562.2	581.6	553.4	503.3	532.6	566.12
GW13	1300.6	1436.5	1450.4	1432.5	1405.6	1442.9	1475.8
GW14	300.5	331.6	350.5	301.3	290.1	303.8	348.38
GW15	230.4	258.6	280.4	270.1	256.4	260.1	275.6
GW16	240.2	264.3	283	278	243	257.6	240
GW17	310	303.2	360.1	326.9	293.4	277	256.2
GW18	462.1	412.1	434.9	404	386	397.4	417

GW= Ground Water Sample No, Unit of Readings μmho/cm

VI. Conclusions

1) It is concluded that the Electrical Conductivity of water changes according to location and month.
2) Conductivity is affected by temperature:
   – As there was decrease in temperature from November to January there was decrease in conductivity.
   – And increase in temperature in February increases the conductivity.

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